

# Serological monitoring of cattle vaccinated with bivalent FMD vaccine at the interface of Limpopo National Park, Mozambique

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## Introduction

Foot-mouth-disease (FMD) is a viral disease, endemic in Africa, the Middle East, South America, Asia and parts of Eastern Europe. It is a major constraint to international exports in livestock and livestock products in many African countries. In Southern Africa, buffaloes are reservoirs of FMD and cattle raised in the vicinity of wildlife conservation areas are at constant risk of becoming infected with FMD viruses. In Mozambique, control of FMD is fundamentally based on vaccination of cattle in zones around protected areas. However, the vaccination protocols recommended by the vaccine producer are expensive and logistically difficult to apply and for that reason the practice has traditionally been to vaccinate all cattle at 6-monthly intervals.

## Objectives of the study

- To monitor the antibody titres to FMDV in vaccinated and control animals to determine the proportion of animals that seroconvert after a single primary vaccination.
- To determine the duration of immunity induced by a single dose of the FMD vaccine.
- To compare immune responses of vaccinated animals living in low risk (no wildlife contact) and high risk (wildlife contact) areas for FMDV transmission

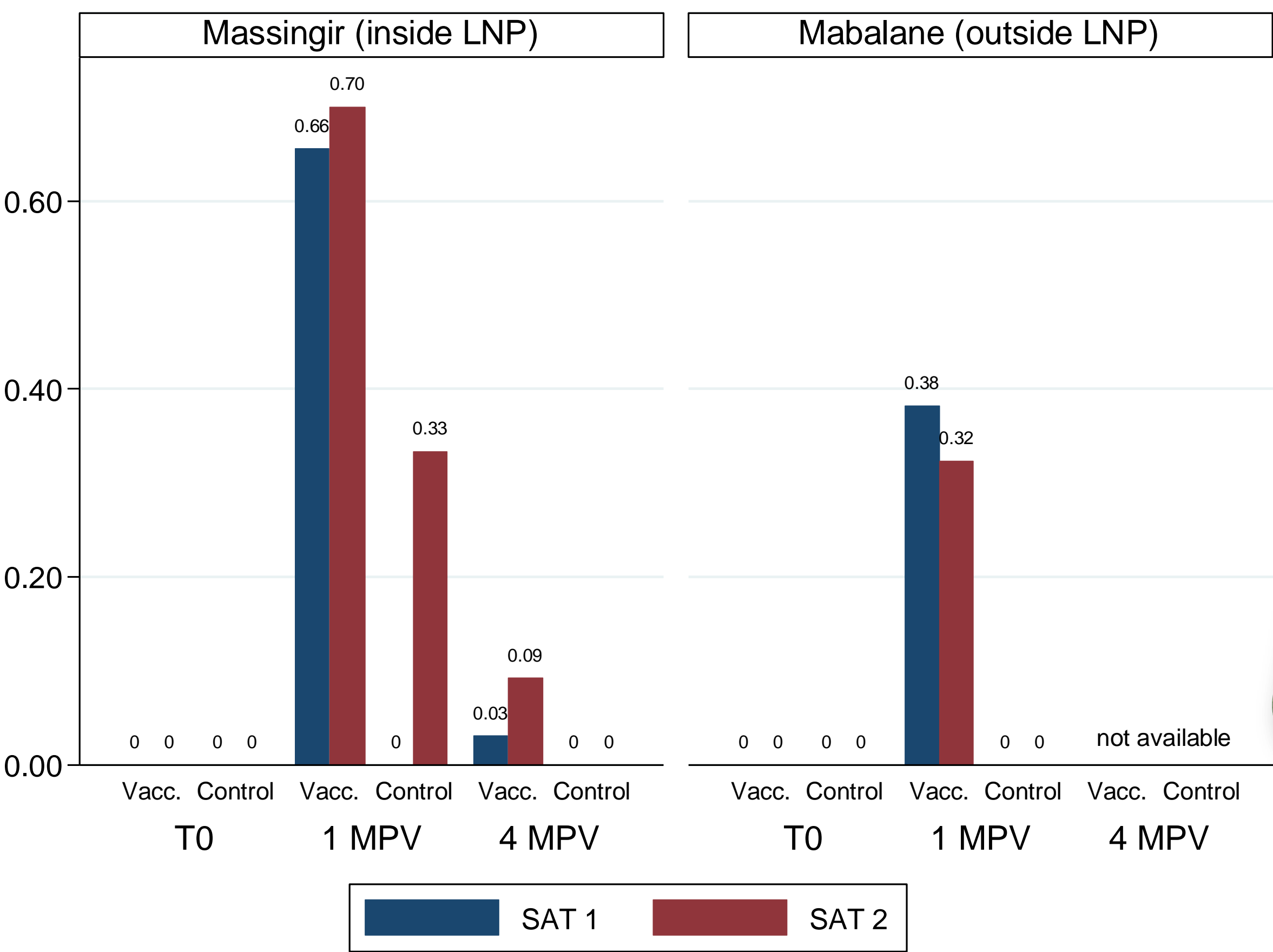


Figure 2: Proportion of seropositive animals during the study in both districts.

## Laboratory Analysis

All cattle samples were tested for antibodies to SAT 1, SAT 2 and SAT 3 at the OIE FMD Reference Laboratory in South Africa (ARC-OVI) using the liquid-phase blocking ELISA (LPB-ELISA). For all assays titres  $\geq 1.6$  were considered positive. Positive samples were tested for antibodies against Non Structural Proteins (NSP)

## Results

At T0, none of animals tested had significant antibody levels to any of the all 3 SAT viruses in both areas (Figure 2).

In Massingir District, the proportion of animals sero-positive to SAT 1 and SAT 2 at 1 MPV was 66% and 70%, respectively, but declined to 3% and 9% at 4 MPV.

In Mabalane District the proportion of seropositive animals at 1 MPV was 32 and 38%. These differences between the districts at 1 MPV were significant ( $p < 0.01$ ).

At 1 MPV, 4/12 unvaccinated control animals in Massingir District (2 in 2 different villages) were sero-positive and showed antibodies against SAT 2, but these animals tested negative to the NSP test.



Figure 1: Study Area showing locations of sampling areas Mabalane (red dot) Massingir (blue dot)



## Methodology

The study was performed in two different districts at the interface of Limpopo National Park (LNP): One in Massingir (inside LNP) and the other in Mabalane (outside LNP). The main difference between those two districts is the potential for contact with African buffalo, high within the LNP. Five villages were monitored in total (see Table 1). A total of 175 animals were vaccinated at T0 with regionally produced bivalent FMD vaccine (including SAT 1 and SAT 2 antigens). Unvaccinated controls were included in the study. Every animal was bled immediately prior to vaccination (T0), 1 month post-vaccination (MPV), and at 4, 5, 6, 8, 10 and 12 MPV. Animals were revaccinated at 4 or 6 months after initial vaccination, but only results up to 4 MPV are reported here.

District	Village	T0		1 MPV		4 MPV	
		Vacc.	Control	Vacc.	Control	Vacc.	Control
Massingir	Bingo	33	12	31	5	13	1
	Chimangue	39	5	33	3	28	3
	Machamba	27	5	26	4	24	4
Mabalane	Covela	41	6	16	1		
	Pfukwe	35	14	18	9		
TOTAL		175	42	124	22	65	8

Table 1: Numbers of animals sampled per village and district

## Conclusions

In Massingir, a high proportion of vaccinated cattle have seroconverted by 1 MPV. There was no significant difference between the proportion of animals that seroconverted to the two different SAT serotypes. The vaccination induced levels of herd immunity at 1 MPV are close to the theoretical limits required to prevent an outbreak of FMD. However, the percentage of sero-positive animals within each herd decreased to negligible levels within 4 MPV. A significantly lower proportion of sero-positive animals were observed in Mabalane. The difference in proportion observed between districts was attributed to cold chain maintenance problems. Another hypothesis to explain this difference could be that previous exposure to FMDV due to contact with buffalo inside LNP resulted in an improved (anamnestic) antibody response in Massingir District. There was no indication of clinical FMD in either cohorts.

- The 4 control animals with a positive response against SAT2 are most likely to be a misclassification error.
- These results provide important information for consideration in the control of FMD based on vaccination in Southern Africa:
- Vaccine handling can significantly impact on the efficacy of the vaccination campaign.
  - Vaccination programmes based on 6-monthly application are unlikely to provide adequate herd immunity levels for effective FMD management of SAT virus infections.

### References

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